



THE UNIVERSITY *of* EDINBURGH

## Edinburgh Research Explorer

### Mental imagery in chronic pain

**Citation for published version:**

Gosden, T, Morris, PG, Monteiro da Rocha Bravo Ferreira, N, Grady, C & Gillanders, DT 2014, 'Mental imagery in chronic pain: Prevalence and characteristics', *European Journal of Pain*, vol. 18, no. 5, pp. 721-728. <https://doi.org/10.1002/j.1532-2149.2013.00409.x>

**Digital Object Identifier (DOI):**

[10.1002/j.1532-2149.2013.00409.x](https://doi.org/10.1002/j.1532-2149.2013.00409.x)

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Peer reviewed version

**Published In:**

European Journal of Pain

**Publisher Rights Statement:**

© Gosden, T., Morris, P. G., Ferreira, N. B., Grady, C., & Gillanders, D. T. (2014). Mental imagery in chronic pain: Prevalence and characteristics. *European Journal of Pain*, 18(5), 721-728. 10.1002/j.1532-2149.2013.00409.x

**General rights**

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



Cite As: Gosden, T., Morris, P. G., Ferreira, N. B., Grady, C., & Gillanders, D. T. (2014). Mental imagery in chronic pain: Prevalence and characteristics. *European Journal of Pain*, 18(5), 721-728. [10.1002/j.1532-2149.2013.00409.x](https://doi.org/10.1002/j.1532-2149.2013.00409.x)

## **Mental Imagery in Chronic Pain: Prevalence and Characteristics**

Running Head: Mental Imagery in Chronic Pain

Thomas Gosden, University of Edinburgh / NHS Lothian Chronic Pain Service

Paul G. Morris, University of Edinburgh

Nuno B. Ferreira\*, University of Edinburgh

Caroline Grady, University of Edinburgh

David T. Gillanders, University of Edinburgh / NHS Lothian Chronic Pain Service

\*Corresponding author

Address:

Clinical and Health Psychology, School of Health in Social Science,  
University of Edinburgh, Teviot Place, Edinburgh, EH8 9AG, United Kingdom  
[Nuno.Ferreira@ed.ac.uk](mailto:Nuno.Ferreira@ed.ac.uk), Tel: +44(0)131 650 3898, Fax: +44(0)131 651 3971

Article Type: Original article in Therapeutics and Psychology

Sources of Funding: None declared

Conflicts of interest : None declared

### **What is already known about this topic?**

- Recent literature indicates that mental imagery may influence psychological responses to chronic pain.
- Mental imagery can be targeted in psychological treatment for patients with chronic pain.

### **What does this study add?**

- The content of mental images of pain can be reliably categorized in ways that illustrate the meanings and implications of pain for the patient.
- Mental images of pain are frequent, moderately vivid and are related to distress in chronic pain sufferers

## **Mental Imagery in Chronic Pain: Prevalence and Characteristics**

*Background:* Research into mental imagery has increased our understanding of a range of psychological problems. However, there has been little study into the spontaneous mental images experienced in response to chronic pain. This study aimed to explore the prevalence and characteristics of these pain related mental images.

*Methods:* 491 people with chronic pain who had attended a pain clinic were sent invites to participate and 105 people responded (21%). A mixed-methods approach (quantitative and qualitative) was used to explore the prevalence of pain related mental imagery, differences between imagers and non-imagers, and the content of imagery in pain.

*Results:* In our sample 36% of respondents reported having mental images of their pain, with the majority describing them as clear and vivid (83%), experienced daily (80.5%), and distressing (83%). Participants who experienced mental images reported higher depression scores, higher anxiety and higher pain unpleasantness. Frequency of imagery was associated with greater pain unpleasantness. Content analysis of the pain images revealed emerging themes relating to the sensory qualities of pain, anatomical representations, pain as a form of threat or attack, pain as an object and pain as an abstract image.

*Conclusions:* This study describes themes and characteristics of pain related mental imagery and confirms that they are a frequent, vivid and distressing experience for many chronic pain sufferers. The results of this study suggest that pain related mental imagery could provide an additional route for assessment and intervention. Further research should focus on assessment, measurement and intervention in clinical populations.

## **Introduction**

Chronic pain is a significant public health concern associated with high levels of distress and disability (e.g. Smith *et al.*, 2001). In a recent large-scale study (n=7400), Breivik *et al.* (2006) report a prevalence of 19% of moderate to severe chronic pain, with 21% of these patients being diagnosed with co-morbid depression and 19% reporting having lost their job due to pain. Because complete pain relief is rarely possible, therapeutic interventions have focused on reducing levels of functional impairment and distress resulting from pain. Psychological approaches such as Cognitive Behavioural Therapy (CBT) have been particularly effective in achieving these goals (Morley *et al.*, 1999; Eccleston *et al.*, 2009) by bringing about changes in key cognitive and behavioural factors such as fear-avoidance, catastrophising, and self-efficacy (e.g. Keefe *et al.*, 2004).

Historically, cognitive factors have been primarily conceptualised as verbal, language-based entities. However, in recent years the study of cognitions as mental images has received great interest. Recent studies suggest that image based cognitions may play a role in the development and maintenance of disorders such as anxiety (e.g. Hackman and Holmes, 2004) or depression (Patel *et al.*, 2007). As a result several papers have

described imagery-based psychotherapeutic techniques in the treatment of psychological disorders (e.g. Grunert *et al.*, 2007; Hunt and Fenton, 2007; Wild *et al.*, 2007).

While the role of verbal cognitions in chronic pain has received much interest, little attention has been paid to the possible role of cognitions in imagery form (pain-related mental images) in the maintenance of disability and distress. Recent studies have started to address this issue. In a study by Phillips (2011), chronic pain participants reported increased distress associated with pain imagery in the form of memories, imagined catastrophic futures and anatomical representations. In Berna *et al.*'s (2011) qualitative study of women with longstanding pelvic pain, participants also reported negative affectivity associated with pain-related mental images of sensory qualities of pain, threat and future implications of pain in one's life. Recently, Gillanders *et al.* (2012) investigated the presence of mental imagery and links with depression, anxiety, and catastrophizing in a chronic pain sample. Patients who reported pain imagery (24% of sample) reported significantly higher levels of anxiety, depression, and catastrophising than patients who did not report pain imagery (effect sizes:  $d = 0.76$ ,  $0.51$ , and  $0.67$  respectively). Finally in a pilot randomised controlled trial of imagery re-scripting in patients with pain, Phillips and Samson (2012) showed that patients can change their pain-related mental images and that this has important impacts on pain, anxiety, sadness, anger and appraisals of health threat and mental defeat. Whilst this study did not investigate the long-term stability of these changes, it is further evidence that there is an important relation between pain-related mental images and psychological functioning.

Using a chronic pain sample and a mixed method approach, the current study aimed to further explore the prevalence of pain-related mental images and their characteristics (vividness, frequency, interference and distress); associations with pain severity, anxiety and depression, spontaneous experience of imagery in everyday life; and thematic content.

## **Materials and Methods**

### *Design*

This study used a cross-sectional mixed-method design in which participants responded to a survey comprising both quantitative measures and open-ended questions.

### *Participants*

Participants were drawn from a heterogeneous population of patients attending a chronic pain service within a large UK NHS teaching hospital. Patients with pain as a direct result of cancer are not routinely seen by this service.

### *Inclusion criteria*

All participants were NHS patients who had attended an initial assessment appointment with a Consultant Anaesthetist at the chronic pain service during a 14-month period. All participants were over 18 years old at time of inclusion. There was no upper age limit, in keeping with the clinic's referral criteria.

### *Exclusion criteria*

All patients who were currently receiving psychology input from either TG or DTG were excluded from participation. Patients taking part in a concurrent longitudinal study into emotion in chronic pain were also excluded, as were patients who had taken part in a previous study of mental imagery in pain (Gillanders *et al.*, 2012).

### *Ethical approval*

This study was approved by the local NHS Research Ethics Committee and the University of Edinburgh, School of Health in Social Science.

### *Procedure*

Four hundred and ninety-one postal questionnaire packs were sent to participants' home addresses. The questionnaire pack included a letter of invitation, a participant information sheet, a survey with several measures (described below) and a stamped addressed envelope for return of questionnaires.

### *Measures*

#### *Chronic Pain Mental Imagery Questionnaire*

As no suitable measure of pain-related mental imagery currently exists, this questionnaire was designed specifically for this study. Participants were asked if they experienced mental images of their pain (Yes/No) after they were given the following introductory text:

“We are particularly interested in finding out if you have a picture or a mental image of what your pain is like. A mental image is like having a picture in your head which may include things you can imagine seeing, hearing or feeling.”

If participants responded “yes” they were then asked to provide an open-ended description of their pain image. A participant was only considered to have an image when the description clearly reflected a visual image; descriptions of other sensory representations without visual imagery or descriptions of distress or of the experience of pain which did not involve visual imagery were not considered to be images. This approach departs from those previously used in Berna *et al.* (2011) or Phillips (2011), as it does not ask participants to match their images with pre-determined meaning categories, therefore reducing the possibility of priming / suggestion or recollection bias. Three further closed questions inquired about the vividness [drawn from the Vividness of Visual Imagery Questionnaire (Marks, 1973)], frequency of intrusion of pain images, interference of images on daily life, and the distress caused by these images.

#### *McGill Pain Questionnaire- Short Form (MPQ-SF)- Melzack (1987)*

The McGill Pain Questionnaire- Short Form is a brief self-report measure of pain severity during the preceding week. It includes 15 pain descriptive words in the sensory (n=11) and affective (n=4) dimensions drawn from the full length McGill Pain Questionnaire (Melzack, 1975). Each pain descriptor is rated on a four-point severity scale, providing severity measures in the sensory (range=0-33) and affective (range=0-12) dimensions, in

addition to a total score (range=0-45). The MPQ-SF also includes a visual analogue scale measure of present pain intensity, which is scored on a range from 0 to 10. The MPQ-SF has been reported to be a sensitive and reliable measure of treatment response and to be highly correlated with the full version of the McGill Pain Questionnaire (Melzack, 1987), which itself has good levels of test-retest reliability (Graham *et al.*, 1980).

*Depression, Anxiety and Positive Outlook Scale (DAPOS)- Pincus et al. (2004)*

The DAPOS is an 11-item brief self-report measure of depression, anxiety and positive outlook that has been developed specifically for a chronic pain population. The scale was developed from two commonly used self-report measures (the Beck Depression Inventory- 2<sup>nd</sup> Edition (Beck *et al.*, 1996), and the Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983) using exploratory factor analysis in order to provide a concise, chronic pain specific measure which avoids problems resulting from criterion contamination by somatic items. Results from the development of this scale indicate that it is a reliable measure of depression, anxiety and positive outlook in patients with chronic pain and has good evidence of validity (Pincus *et al.*, 2004).

*Spontaneous Use of Imagery Scale (SUIS)- Reisberg et al. (2003)*

The SUIS is a 12-item self-report measure of use of imagery in everyday situations. Items such as, “when going to a new place, I prefer directions that include detailed descriptions of landmarks (such as the size, shape and colour of a petrol station) in addition to their names” are rated on a five-point Likert scale from 1, “never appropriate” to 5, “always appropriate”, producing a mean item score, averaged across all items (range=1-5). Reisberg *et al.* (2003) report a mean item score of 3.11 (SD= 0.66). The scale has been used in subsequent research into mental imagery (Mast *et al.*, 2003; Holmes *et al.*, 2006). Reisberg *et al.* (2003) report that mean scores on the SUIS correlate significantly with scores on the Vividness of Visual Imagery Questionnaire (Marks, 1973), a well established measure of self-reported imagery vividness, indicating that those with more vivid images tend to use imagery more in everyday life.

*Data analysis*

Independent samples t-tests were used to examine hypotheses regarding differences between imagers and non-imagers on standardised measures of pain anxiety, depression, positive outlook on life and use of imagery in everyday life. One intention of this study was to replicate and extend the findings of Potter *et al.* (2012). Based on that study we predicted that participants reporting imagery would score higher for pain, depression and anxiety. As such, one-tailed significance tests were used. Quantitative data regarding the characteristics of mental images were examined and presented using descriptive statistics. Pearson correlations explored possible associations between image characteristics and standardised measures as described above. Participants’ written descriptions of their mental images were thematically analysed in order to generate distinct themes. TG initially conducted this analysis with additional input from CG and DG. Two evaluators (PGM and NF) subsequently independently scored each mental image descriptor according to the themes generated and inter-rater agreement Kappa coefficients were calculated.

Questionnaire returns were deemed to be spoilt if they either did not indicate whether or not the participant experienced an image of their pain or did not provide information regarding the characteristics of their mental image (if experienced) or did not complete the standardised measures. The DAPOS questionnaire was scored pro-rata if up to two data points were missing, and deemed spoilt only if three or more data points were missing.

## **Results**

### *Return rate and imagery prevalence*

Of the 491 questionnaires sent, 105 were returned unspoilt (spoilt N=7), representing a return rate of 21%. Forty-one respondents reported experiencing a mental image of their pain and provided a description of this pain. For 36 of these the description was clearly of a mental image; however for the remaining five the description reflected either a general expression of pain related distress or a description of the sensation of pain rather than a clear mental image of the pain. To ensure that our mental imagery group all experienced a mental image of their pain, these five individuals were excluded from further analysis. Therefore the percentage of patients reporting a clear mental image of their pain was 36% (N=36)

### *Comparisons between Imagers and non-Imagers*

Table 1 presents the sample's demographics and group comparisons. Of the 100 participants, 32 were male and 68 female. The mean age of the sample was 59.73 years, with a range of 19 to 90 years. Age and gender were not significantly different between the imagery group and the non-imagery group.

Participants reporting pain related mental imagery did not score more highly for pain intensity or the sensory dimension of pain than non-imagers, but had higher scores on the affective dimension of the McGill Pain Questionnaire, indicating higher pain unpleasantness. The imagery group also scored more highly for depression and anxiety than the no imagery group. Imagers also tended to use imagery more frequently in everyday life, as evidenced by higher mean scores on the SUIIS.

**(Insert Table 1 around here)**

### *Pain-Related Image characteristics*

All 36 participants reporting imagery provided data regarding the characteristics of their images.

Vividness of pain related images was reported on a scale from "1- No image at all" to "5- Perfectly clear image", based upon Mark's Vividness of Mental Imagery Scale (Marks, 1973). Thirty respondents (83.3%) rated their mental image as being at least moderately clear and vivid ( $\geq 3$ ), with only 6 (16.7%) reporting having just a vague or no clear image of their pain ( $< 3$ ).

The frequency with which participants experienced intrusive pain-related images was reported on a scale from “1- Almost never” to “5- Many times a day”. 29 respondents (80.5%) indicated that they experienced their mental image at least daily ( $\geq 4$ ) with the remaining 7 (19.4%) reporting only weekly or monthly experiences of pain-related images ( $< 4$ ).

Participants rated the degree of interference in daily life as a result of their pain images on a scale from 0 (“*does not interfere at all*”) through 50 (“*moderately interferes*”) to 100 (“*severely interferes*”). 22 participants (61.1%) rated the degree of interference of these images as moderately to severely interfering.

Participants rated how distressing or pleasant their mental image was on a scale from -50 “very distressing”, through 0 “neither distressing nor unpleasant” to +50 “very pleasant”. The mean value on this measure was -25.83 (SD=16.67), indicating that participants found their images to be moderately distressing on average. The range (-50 to 0) reveals that all participants found their images to be either distressing or neutral. The considerable majority (30/36, 83.3%) rated their mental image as -10 or worse, only 6 (16.7%) rated their images as neutral and no participant rated their image as pleasant.

To summarise, most participants’ mental images of their pain were distressing, clear and reasonably vivid, occurred daily or more frequently and were considered to be interfering in daily life.

No significant associations were found between Imagery characteristics (vividness, frequency, or how distressing the image was) and either measures of pain (MPQ-SF Total, Sensory, Affective or Intensity) or DAPOS depression, anxiety, or positive outlook scores (all  $p > .05$ ). There was however, a significant correlation between imagery frequency and the affective component of the MPQ-SF ( $r = .36, p = .030$ ) and between imagery interference and present pain intensity ( $r = .42, p = .014$ ).

#### *Descriptions of pain-related images*

Thirty-six participants reported experiencing a mental image of their pain and provided a written description of their image. The following themes emerged from this data when content analysed, with examples of descriptions relating to these themes provided in Table 2:

**Sensory qualities:** Image descriptions involve sensory descriptors of pain with elements of Temperature (Hot/Cold); Pressure; Electricity; Shooting; Movement; Auditory; Olfactory; Proprioceptive. It can also involve descriptors of an attack action but without the external intentional agent.

**Anatomical representations:** Images involve the description of the anatomical features of the area in pain or organic/physiological processes occurring in the pain affected area.

**Pain as an object:** Image descriptions encapsulate the pain in an object format. There is a clear sense of shape and boundary.



**Pain as an Attack:** Image descriptions involve themes of attack and an intentional agent external to the self that is causing the pain

**Pain as an abstract image:** Image descriptions that involve abstract concepts.

From the 36 patients, 45 different images were generated (see Table note). Two raters independently categorised each image description into one of the above themes, obtaining a good agreement, Kappa=.767 ( $p<.001$ ).

**(Insert Table 2 around here)**

## **Discussion**

This study extends work in this area, using a sample recruited from a chronic pain clinic. The findings may therefore be applicable to a wider range of chronic pain patients than previous studies which have been based either specifically on chronic pelvic pain (Berna *et al.*, 2011) or on mixed acute or chronic pain (Phillips, 2011). The paper also expands on previous categorisations of pain-related imagery, providing descriptions and analysis of patients' pain-related visual images.

In this study 36% of participants reported pain-related mental images. This rate is higher than that found by Gillanders *et al.* (2012), but lower than the 78% found in Phillips (2011). This may be due to the assessment method: interview in Phillips (2011) and postal survey in the present study. Lower rates in postal studies may be linked to the lack of an example of what is considered to be an image. A further limitation of postal survey is lower response rates, with the 21% response rate in the current study necessitating caution in generalising to the full population of people with chronic pain. Postal surveys might also lead to patients providing a descriptive metaphor for their pain rather than reporting an image that they actually experience. Contrary to this view; in a second interview-based study from the current sample, 14 out of 16 patients (87.5%) could reliably invoke and describe their imagery (Gosden, 2008, unpublished data). Berna *et al.* (2012) also conclude that patients are experiencing these intrusive images, and not simply using imagery based language to describe pain. Future empirical studies employing both interview-based and questionnaire-based methods could determine the upper and lower estimates of the prevalence of mental images.

The findings of the current study replicate Gillanders *et al.* (2012), with imagers found to score more highly on measures of depression and anxiety than non-imagers. The finding that frequency of imagery intrusion is related to pain unpleasantness is an extension of previous work. In behavioural terms, pain related mental imagery may function as a 'motivative augmental': a private event that enhances the reinforcing properties of an existing stimulus (a detailed description of behavioural perspectives on the role of cognitive events is beyond this paper, interested readers are referred to Zettle & Hayes,

1982). From this perspective, pain imagery may serve to ‘enhance’ the natural avoidance response to pain sensation.

Whilst people with mental images of their pain experience higher levels of distress, the direction of this relationship remains unknown. Pain-related images may be a consequence or cause of increased distress, or they may both be related to a third factor. It is interesting that those reporting pain-related mental imagery also report experiencing imagery-based cognition more frequently in everyday life. Tentatively; it may be that when individuals who naturally experience imagery develop chronic pain, they have a tendency to process pain using images and that this elaborates pain related meanings and associated distress.

This study also shows that for most people who have a mental image of their pain, it is vivid, distressing, interferes in daily life and is high in frequency. Surprisingly, these characteristics do not appear to be related to higher distress. We would expect such correlations, similarly to other cognitive factors such as kinesophobia (Vlaeyen and Linton, 2000) or catastrophising (Sullivan *et al.*, 2001). There is considerable work still to be done regarding reliable and valid measurement of mental imagery and its characteristics (e.g. Nunally & Bernstein, 1994). The absence of these hypothesised associations might relate to underdeveloped measurement of imagery characteristics.

The current study shows the reliability of themes within pain imagery. Images in the current study fell within five themes. The first theme related to sensory qualities of the pain and may be ways of representing and making sense of the sensory experiences of chronic pain. Whilst there is some overlap between this theme and the themes reported by previous studies (Berna *et al.*, 2011; Phillips, 2011), the greater specificity in the current study (asking about images of pain) may have led to more reporting of sensory quality images. The overlap with the kinds of imagery descriptions provided by Gillanders *et al.* (2012) is more evident, suggesting that how we ask about imagery affects participants’ responses.

The theme of ‘anatomical representations’ of pain may reflect participants’ understanding (or misunderstanding) of pain mechanisms. These images may reveal implicit beliefs regarding the cause, consequences, and prognosis of pain, which for some patients may be harder to verbalise. Clinicians may use this finding in assessment, particularly for patients who are less able to directly report beliefs about pain. This theme is also evident in the themes described by Gillanders *et al.* (2012), Berna *et al.* (2011) and Phillips (2011), giving us greater confidence in this finding.

The theme of pain as an attack was also common. This could simply reflect attempts to make sense of the sensory quality of pain (e.g. ‘as if’ one is being stabbed). We tentatively suggest however, that the incorporation into the imagery of an ‘attacking agent’ could be viewed as reflecting beliefs about victimisation or punishment. This suggestion is speculative and further investigation is required. Berna *et al.* (2011) describe similar images, though this theme is not evident in Phillips (2011). The relationship between a person and their own mental content is a focus of intervention in a

number of therapies, including Cognitive Therapy (e.g. Hollon and Beck, 1979), Schema Therapy, (ST: Young, Klosko and Weishaart, 2002), Mindfulness Based Cognitive Therapy (MBCT: Segal, Williams & Teasdale, 2002), Compassion Focused Therapy (CFT: Gilbert, 2009) and Acceptance and Commitment Therapy (ACT: Hayes, Strosahl & Wilson, 2011). In each of these therapies, visualisation can be used to adopt a new perspective on mental content as 'distinct' from the self and to foster a less victimized relationship to self-critical cognition. Similar interventions may be appropriate where pain related imagery contains suggestions of victimization, attack or punishment.

The theme of pain as a localised object may reflect a further dimension of sensory discrimination, though it may also relate to beliefs about the personal meaning of pain. Localising or externalising images may function to emphasise the pain as distinct from the body and the self. This could be adaptive perspective taking (as described above) or could relate to a perceived lack of control over pain, or to low levels of acceptance of pain, factors that have been associated with poorer psychological adjustment to chronic pain (Crisson and Keefe, 1988; McCracken, 1998). This theme is less evident in Phillips (2011), but is present in Berna *et al.* (2011).

In summary, meaningful themes relating to personal meanings of pain can emerge from brief descriptions given on a postal questionnaire. There is a good deal of overlap between the images reported in the current study and previous investigations of mental imagery in patients with pain, and there are also notable differences. Berna *et al.* (2011; 2012) describe some participants having coping images, as well as negative affect images. Whilst some of the images in the current study contain negative affect themes, none of them were categorised as coping images. Phillips (2011) describes a broader range of imagery: images of future or past catastrophe, negative self-appraisals as well as anatomical images, similar to our findings. These differences likely relate to methods of enquiry. In both the current study and Gillanders *et al.* (2012), participants are asked about images of pain. In Phillips (2011), the assessment was broader: "Are there thoughts which you picture to yourself when you are in pain?" Restricting the enquiry to images of pain, may lead to clinicians missing important imagery themes. Future research in this field should include a broad approach to sampling mental imagery. In addition, we don't yet know how sensory related images and self and future related images relate to each other and to other aspects of pain experience. It would be interesting to see if the sensory and affective dimensions of the MPQ would be differentially associated with these different themes of imagery.

Imagery rescripting interventions can successfully modify imagery, leading to improvements in a range of psychological disorders (for a review see Holmes, Arntz and Smucker, 2007). Phillips and Samson (2012) have shown preliminary evidence that imagery rescripting is also possible for patients with pain. Given the reliability of imagery themes and suggested links to meaning in the current study, targeting pain related mental images could be a further tool in the psychological assessment and treatment of patients with chronic pain. Such imagery intervention might seek to alter the content of images to make them less distressing, but might also target the relationship *between* a person and their mental imagery. Helping someone to become more aware of mental imagery as distinct from pain sensation and from the self could be a promising

avenue for future clinical research. Such an approach would be suggested by approaches such as ACT and MBCT, whereas approaches such as Schema Therapy, Cognitive Therapy and Compassion Focussed Therapy would likely advocate changing the content of imagery such that it becomes less punishing / attacking and less catastrophic.

### *Conclusions*

This study confirms that spontaneous mental images of pain are a common experience for many people with chronic pain. They can be reliably categorised into meaning themes. Such images occur frequently and are distressing, interfering, vivid and are associated with greater distress and pain unpleasantness. Further research is needed to develop better assessment and measurement of imagery, and explore therapeutic approaches to working with mental imagery.

### **Author Contributions**

Data collection: Gosden, T

Study design: Gosden, T; Gillanders, D; Morris, P

Data analysis: Gosden, T; Gillanders, D; Morris, P; Ferreira, N; Grady, C.

Manuscript drafting: Gosden, T; Gillanders, D; Morris, P; Ferreira, N

Critical revision of manuscript: Ferreira, N; Gillanders, D; Morris, P

### **References**

Beck, A. T., Steer, R. A., Ball, R., Ranieri, W. (1996). Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. *J Pers Assess* 67, 588–597.

Berna, C., Vincent, K., Moore, J., Tracey, I., Goodwin, G. M., Holmes, E. A. (2011). Presence of mental imagery associated with chronic pelvic pain: A pilot study. *Pain Med*, 12, (7),1086-93.

Berna, C., Tracey, I., Holmes, E. A. (2012). How a better understanding of spontaneous mental imagery linked to pain could enhance imagery-based therapy in chronic pain. *J Exp Psych*. 3 (2), 258-273.

Breivik, H., Collett, B., Ventafridda, V., Cohen, R., Gallacher, D. (2006). Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain* 10(4), 287-333.

Crisson, J.E. and Keefe, F.J. (1988). The relationship of locus of control to pain coping strategies and psychological distress in chronic patients with pain. *Pain*, 35(2), 147-154.

Eccleston, C., Williams, A.C.D.C., Morley, S.(2009). Psychological therapies for the management of chronic pain (excluding headache) in adults. *Cochrane DB Syst Rev*, Issue 2. Art. No.: CD007407. DOI: 10.1002/14651858.CD007407.pub2.

Gilbert, P. (2009). *The Compassionate Mind*. London: Constable-Robinson.

Gillanders, D., Potter, L., Morris, P. G. (2012). Pain-Related Visual Imagery is Associated with Distress in Chronic Pain sufferers. *Behav Cogn Psychoth* 40(5), 577-589.

Gosden, T. (2008). *Images of pain: Exploration of the characteristics and functions of pain-related mental imagery in chronic pain*. Unpublished doctoral thesis, University of Edinburgh. Available at: <http://www.era.lib.ed.ac.uk/handle/1842/2742>

Graham, C., Bond, S.S., Gerkovich, M.M., Cook, M.R. (1980). Use of the McGill Pain Questionnaire in the assessment of cancer pain: replicability and consistency. *Pain*, 8(3), 377-387.

Grunert, B.K., Weis, J.M., Smucker, M. R., Christianson, H.F. (2007). Imagery rescripting and reprocessing therapy after failed prolonged exposure for post-traumatic stress disorder following industrial injury. *J Behav Ther Exp Psy* 38(4), 317-328

Hackmann, A., Clark, D.M., McManus, F. (2000). Recurrent images and early memories in social phobia. *Behav Res Ther* 38, 601-610.

Hackmann, A. and Holmes, E.A. (2004). Reflecting on imagery: a clinical perspective and overview of the special issue of *Memory* on mental imagery and memory in psychopathology. *Memory* 12(4), 389-402.

Hackmann, A., Surawy, C., Clark, D.M. (1998). Seeing yourself through others' eyes: a study of spontaneously occurring images in social phobia. *Behav Cogn Psychoth* 26, 3-12.

Hayes, S. C., Strosahl, K., D., Wilson, K. G. (2011). *Acceptance and Commitment Therapy (2nd Edition): The process and practice of mindful change*. New York: Guilford Press.

Hollon, S. D., Beck, A. T. (1979). Cognitive therapy of depression. In P. C. Kendall & S. D. Barlow (Eds.), *Cognitive-behavioral Intervention: Theory , Research, and Procedures* (pp. 153-203). New York: Academic Press.

Holmes, E. A., Arntz, A., Smucker, M. R. (2007) Imagery rescripting in cognitive behaviour therapy: Images, treatment techniques and outcomes. *J Behav Ther Exp Psy* 38(4), 297-305.

Holmes, E.A., Mathews, A., Dalgleish, T., Mackintosh, B. (2006). Positive interpretation training: effects of mental imagery versus verbal training on positive mood. *Behav Ther* 37(3), 237-247.

Hunt, M. and Fenton, M. (2007). Imagery rescripting versus in vivo exposure in the treatment of snake fear. *J Behav Ther Exp Psy*, 38(4), 329-344.

- Keefe, F.J., Rumble, M.E., Scipio, C.D., Giordano, L.A., Perri, L.M. (2004). Psychological aspects of persistent pain: current state of the science. *J Pain* 5(4), 195-211.
- Marks, D.F. (1973). Visual imagery differences in the recall of pictures. *Brit J Psychol* 64(1), 17-24.
- Mast, F.W., Ganis, G., Christie, S., Kosslyn, S.M. (2003). Four types of visual mental imagery processing in upright and tilted observers. *Cognitive Brain Res* 17(2), 238-247.
- McAvinue, L. and Robertson, I. (2006). Measuring visual imagery ability: a review. *Imagination, Cognition and Personality*, 26(3), 191-211.
- McCracken, L.M. (1998). Learning to live with the pain: acceptance of pain predicts adjustment in persons with chronic pain. *Pain*, 74(1), 21-27.
- Melzack, R. (1975). The McGill Pain Questionnaire: major properties and scoring methods. *Pain*, 1(3), 277-299.
- Melzack, R. (1987). The short form McGill Pain Questionnaire. *Pain*, 30, 191-197.
- Morley, S., Eccleston, C., Williams, A. (1999). Systematic review and meta-analysis of randomised controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. *Pain*, 80, 1-13.
- Morrison, A.P. (2004). The use of imagery in cognitive therapy for psychosis: a case example. *Memory*, 12(4), 517-524.
- Muse, K., McManus, F., Hackmann, A., Williams, M., Williams, M. (2010). Intrusive imagery in severe health anxiety: Prevalence, nature and links with memories and maintenance cycles. *Behav Res Ther* 48(8), 792-798.
- Nunnally, J. C., Bernstein, I. H. (1994). *Psychometric theory (3rd ed.)*. New York: McGraw-Hill.
- Philips, H. C. (2011). Imagery and pain: the prevalence, characteristics, and the potency of imagery associated with pain. *Behav Cogn Psychoth* 39, 523–540.
- Phillips, C. and Samson, D. (2012). The rescripting of pain images. *Behav Cogn Psychoth* 40, 558-576.
- Pincus, T., Williams, A.C., Vogel, S., Field, A. (2004). The development and testing of the depression, anxiety, and positive outlook scale (DAPOS). *Pain* 109(1-2), 181-188.
- Reisberg, D., Pearson, D.G., Kosslyn, S.M. (2003). Intuitions and introspections about imagery: The role of imagery experience in shaping an investigator's theoretical views. *Appl Cognitive Psych* 17, 147-160.

- Rusch, M., Grunert, B., Mendelsohn, R., Smucker, M. (2000). Imagery rescripting for recurrent, distressing images. *Cogn Behav Pract* 7(2), 173-182.
- Segal, Z. V., Williams, J. M. G., Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression*. New York (Vol. 73, p. 351). Guilford Press
- Smith, B.H., Elliott, A.M., Chambers, W.A., Smith, W.C., Hannaford, P.C., Penny, K. (2001). The impact of chronic pain in the community. *Fam Pract* 18(3), 292-299.
- Smucker, M., Dancu, C., Foa, E., Niederee, J. (1995). Imagery rescripting: a new treatment for survivors of childhood sexual abuse suffering from post-traumatic stress. *J Cogn Psychoth* 9, 3-17.
- Steil, R. and Ehlers, A. (2000). Dysfunctional meaning of posttraumatic intrusions in chronic PTSD. *Behav Res Ther* 38, 537-558.
- Sullivan, M., Thorn, B., Haythornthwaite, J., Keefe, K., Martine, M., Bradley, L., Lefebvre, J. (2001). Theoretical Perspectives on the relation between catastrophizing and pain. *Clin J Pain* 17, 52-64.
- Vlaeyen J. W. S. and Linton S.J.(2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*, 85:317-32.
- Wheatley, J., Brewin, C.R., Patel, T., Hackmann, A., Wells, A., Fisher, P., Myers, S. (2007). I'll believe it when I can see it: imagery rescripting of intrusive sensory memories in depression. *J Behav Ther Exp Psy* 38(4), 371-385.
- Wild, J., Hackmann, A., Clark, D.M. (2007). When the present visits the past: updating traumatic memories in social phobia. *J Behav Ther Exp Psy* 38(4), 386-401.
- Young, J.E., Klosko, J.S., Weishaar, M.E. (2003). *Schema therapy: A practitioner's guide*. New York: Guilford Press.
- Zettle, R. D., & Hayes, S. C. (1982). Rule governed behavior: A potential theoretical framework for cognitive behavior therapy. In P. C. Kendall (Ed.), *Advances in cognitive behavioral research and therapy* (pp. 73- 118). New York: Academic Press.
- Zigmond, A. S., and Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatr Scand* 67, 361-370.

**Table 1.** Comparisons between those who reported spontaneous pain related imagery and those who did not.

	All participants <i>n</i> =100 Mean ( <i>SD</i> )	Reported Imagery <i>n</i> =36 Mean ( <i>SD</i> )	No Imagery <i>n</i> =64 Mean ( <i>SD</i> )	<i>t</i> <sub>(98)</sub>	<i>p</i>	<i>d</i>
Age in years	59.73(16.35)	57.78 (16.08)	60.82 (16.52)	.895	. <i>ns</i>	
Female %	68	63.9	70.3	$\chi^2_{(1)} = .437$	. <i>ns</i>	
MPQ-SF <sup>a</sup>						
Pain Intensity	7.36 (2.17)	7.17 (2.28)	7.48 (2.11)	.675	. <i>ns</i> <sup>*</sup>	
Sensory	14.44 (7.50)	13.50 (7.32)	13.81 (7.40)	1.69	. <i>ns</i> <sup>*</sup>	
Affective	4.26 (3.06)	5.08 (2.80)	3.80 (3.12)	1.81	.022 <sup>*</sup>	.43
Total	18.70 (9.78)	21.19 (9.85)	17.30 (9.53)	1.94	.028 <sup>*</sup>	.40
DAPOS <sup>b</sup>						
Depression	8.97 (5.81)	10.88 (5.40)	7.83 (5.78)	1.94	.006 <sup>*</sup>	.55
Anxiety	5.47 (3.79)	6.44 (3.62)	4.90 (3.80)	1.48	.026 <sup>*</sup>	.41
Positive Outlook	8.34 (3.96)	8.86 (3.09)	8.03 (4.39)	1.04	. <i>ns</i> <sup>*</sup>	
SUIS <sup>c</sup>	3.03 (0.88)	3.30 (0.77)	2.87 (0.91)	2.46	.009 <sup>*</sup>	.51

\* One tailed significance <sup>a</sup>McGill Pain Questionnaire- Short Form, <sup>b</sup>Depression, Anxiety and Positive Outlook Scale, <sup>c</sup>Spontaneous Use of Imagery Scale



**Table 2.** Thematic analysis of participants' imagery descriptions with examples

Theme/subtheme label, and number of images in theme	Examples	N Evaluator 1 <sup>a</sup>	N Evaluator 2 <sup>a</sup>
Sensory qualities of pain			
- pressure	<i>"Being enclosed in a metal band"</i>	16	15
- sharpness	<i>"If the pain is very sharp I imagine it as knitting needles being launched down various routes both in my back and legs"</i>		
- burning heat	<i>"Fire going up and down my left side as if someone has a lighted torch trying to set my left side on fire"</i>		
- electricity	<i>"I have an image of an electric short circuit running down my legs!!"</i>		
Anatomical representations of damage	<i>"Bones grinding together"</i>		
	<i>"The discs in my spine crumbling or grinding together causing my body to grind to a halt".</i>	4	4
Pain as an object	<i>"My image looks like a large ball about the size of a tennis ball and it looks spongy and horrible"</i>		
	<i>"It's like a ball of pain- almost a knot of my kidney/right-hand side area and it gets hot and sore and moves about, and throbs"</i>	11	12
Pain as an attack	<i>"Like my body is being attacked (where problems are) by someone with a voodoo doll or a little army inside me making sure I am in agony!"</i>		
	<i>"I feel as though someone is hitting me at the base of my back, causing it to feel weak. I can feel sometimes as though an electric heat is being applied to my right leg."</i>	8	8
Abstract Image	<i>"I see faces in the sky"</i>		
	<i>"Like a piano string being twanged"</i>	5	5

<sup>a</sup> Most patients produced only one image that was evaluated. Eight patients produced two distinct descriptions and images regarding their pain, while one patient produced one description deemed to represent two images. The N's presented therefore relate to the total of 44 images generated by the 36 patients.